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CORR Insights

CORR Insights®: A Novel System for the Surgical Staging of Primary High-grade Osteosarcoma: The Birmingham Classification

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Where Are We Now?

The classic article by Enneking and colleagues [2] laid the cognitive framework for the definition of surgical margins in musculoskeletal tumors. Written in the prechemotherapeutic era, the study provided a common language for orthopaedists and served as a guide to musculoskeletal tumor surgeons, radiologists, and pathologists.

In Enneking's time, radical margins (removal of the anatomic compartment) eradicated the primary tumor, as well as any skip metastases. Wide surgical margins extending through normal tissue resulted in a low risk of local recurrence. The concept of a marginal surgical margin was useful to the surgeon, as it made him or her or more acutely aware of the reactive zone of a tumor—abnormal appearing tissue that potentially contains microscopic tumor extension—which is so important to consider, given that intralesional margins increase the risk of local recurrence.

In the current era, patients with high-grade osteosarcoma are treated with neoadjuvant chemotherapy and surgical resection of the tumor. Since the reactive zone is often narrowed by the use of neoadjuvant chemotherapy, the distinction between marginal and wide margins is not important. With the use of chemotherapy, the risk of local recurrence has shown to be correlated with not just the surgical margins, but also with the response to chemotherapy (measured by percentage of tumor necrosis).

In the current study, Jeys and colleagues take the next step by considering the response of the tumor to chemotherapy and the subsequent effect on surgical margins. They, and others [1], have shown that it is important to factor in the response to chemotherapy in the determination of surgical treatment. The clinical and pathologic distinction between marginal and wide margins following neoadjuvant chemotherapy is useful in determining a safe margin (2 mm, according to Jeys and colleagues). The authors of the current study also showed that the relative risk of local recurrence is lowest with a good chemotherapy response.

Where Do We Need To Go?

To advance this field, we need to verify the distance proposed by Jeys and

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colleagues for negative margins. It remains unclear whether a narrower, or perhaps a wider, distance from the tumor is more predictive of recurrence. I believe that the best determination of margin status requires a partnership between the surgeon and the pathologist where both examine the tumor together, combining their impressions of intraoperative and ex vivo conditions.

Additionally, we need to continue to work on techniques that determine the chemotherapy response prior to tumor resection. We often have a gestalt feel for a good response to chemotherapy when there is no tumor growth—the reactive zone shrinks on MRI, the positron emission tomography uptake decreases, the patient experiences less pain, the tumor mineralizes. Better predictive tools for preoperatively determining agents that more consistently result in favorable tumor necrosis would be useful.

How Do We Get There?

Future multi-institutional studies need to be done to verify the results of this paper. These studies should focus on determining the "minimal safe distance from tumor" that results in low risk of local recurrence. This could be done by measuring the closest distance from the tumor to margin, and correlating this with the chemotherapeutic response. Ideally, good preoperative predictive tools for response to chemotherapy should be stratified with the widest margin necessary to minimize recurrence risk. In patients with a good response to chemotherapy, closer surgical margins may be feasible, allowing joint preservation surgery or other optimal limb salvage techniques. Conversely, in patients with a poor response, the surgeon should avoid close surgical margins and do the safest (wider) surgical resection. By combining the best surgical margin with the ideal reconstructive procedure, we will provide the best balance of safe oncologic surgery with maximal function.

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